

**REMARKS**

Applicants hereby amend claims 2, 4, 8, 10, 12, 13, 26, 28, 29, 30, 32, 47, 48, 50 and 54.

Amendments to independent claims 4 and 47 respond to the Examiner's rejection of said claims under § 101 for claiming non-statutory subject matter. See below.

Amendments to claims 4 and 13 respond to the Examiner's rejection of those claims under § 112 for being indefinite. See below.

The amendments to claims 2, 8, 10, 12, 26, 28, 29, 30, 32, 48, 50 and 54 are made to maintain consistency with the changes made to claims 4 and 47, and to more specifically point out the apparatus involved in performing the method steps.

Amendments to the claims are not an acquiescence to any of the rejections. Silence with regard to any of the Examiner's rejections is not an acquiescence to such. Specifically, silence with regard to Examiner's rejection of a dependent claim, when such claim depends from an independent claim that Applicants consider allowable for reasons provided herein, is not an acquiescence to such rejection of the dependent claim(s), but rather a recognition by Applicants that such previously lodged rejection is moot based on Applicants' remarks and/or amendments relative to the independent claim (that Applicants consider allowable) from which the dependent claim(s) depends. Furthermore, any cancellations of and amendments to the claims are being made solely to expedite prosecution of the instant application. Applicants reserve the option to further prosecute the same or similar claims in the instant or a subsequent application.

Upon entry of the Amendment, claims 2-22, 26-30, 32-33 and 47-57 are pending in the present application.

**Claim Amendments**

Independent claim 4 has been amended as follows:

A method ...performed on a suitably programmed computer system containing at least one input device, at least one output device, at least one storage means, and at least one processor, the method comprising:

(a) determining by means of at least one processor a plurality of alignments ...,

(b) comparing by means of at least one processor the alignment errors to identify an alignment having a smallest error,

(c) based on the alignment having the smallest error, computing by means of at least one processor: a first percent identity relative ...

(d) based upon the computed first percent identity and second percent identity, outputting a result by means of at least one output device to at least one of a user, ...

Support for this amendment is provided, without limitation, at page 15, line 15 to page 17, line 17, and Figures 1A and 1B. See also page 5, lines 14-17, page 6, lines 4-6, page 7, lines 22-24, page 8, lines 9-13, page 9, lines 6-15, 24-28, and page 10, lines 1-21. No new matter is involved.

Independent claim 47 is similarly amended and supported. No new matter is involved.

Dependent claims 2, 8, 10, 12, 26, 28, 29, 30, 32, 48, 50 and 54 depend from claims 4 or 47. These dependent claims have been amended consistent with the above to recite the use of specific apparatus to perform the method. No new matter is involved.

Claims 4 and 13 were amended to clarify language. No new matter is involved.

#### Section 101 Rejections

The Examiner rejected all pending claims as being directed at nonstatutory subject matter, in that they did not produce useful, concrete and tangible results. In particular, the Examiner stated, independent claims 4 and 47 were directed to a method for “comparing a first sequence and a second sequence” comprising steps that do not include a physical transformation of matter or produce a concrete, tangible and useful result. In the telephone conversation between the undersigned and the Examiner summarized below, the Examiner also raised the *Bilski* case and its holdings. As will be discussed more fully below, Applicants do not concede that the Examiner was correct in

her rejections of these claims. However, Applicants have amended claims 4 and 47 (from which all claims depend) in response. In particular, after the amendment claim 4 reads:

A method ..., performed on a suitably programmed computer system containing at least one input device, at least one output device, at least one storage means, and at least one processor, the method comprising:

(a) determining by means of at least one processor a plurality of alignments ...,

(b) comparing by means of at least one processor the alignment errors to identify an alignment having a smallest error,

(c) based on the alignment having the smallest error, computing by means of at least one processor: a first percent identity relative ...

(d) based upon the computed first percent identity and second percent identity, outputting a result by means of at least one output device to at least one of a user, ...

(Claim 47 has been similarly amended.) Applicants respectfully suggest that amended claims 4 and 47 now set forth specific apparatus to which the methods of those claims are tied, as *Bilski* suggests suffices for Section 101 patentable subject matter. In particular, the methods of those amended claims are performed on a computer system containing at least one input device, at least one output device, at least one storage means, and at least one processor. Beyond that, each step of the method is tied to a particular part of the computer system. Moreover, the computer system must have been suitably programmed to carry out the claimed method, and thus is no longer merely one or more general-purpose computers. For all of the above reasons, Applicants respectfully submit that claims 4 and 47 (and therefore all claims which depend therefrom) contain patentable subject matter.

Even without regard to the amendments made, however, Applicants submit that claims 4 and 47 are allowable for another fundamental reason. It has long been understood that a method of manipulating data that represents a physical object in a computer system is patentable. The frequently cited examples are methods of manipulating x-ray and related imaging data. As long ago as *In re Abele*, 684 F.2d 902 (C.C. P.A. 1982), for example, which dealt with an invention “in the field of image

processing, particularly as applied to ...CAT scans,” *Id.* at 903, the court upheld the patentability of claims which covered algorithmic processing of X-ray attenuation data. Importantly, for the patent claims under present consideration, the court upheld patentability of claims that did not require the display of any physical image derived from the x-ray attenuation data. In particular, for example, it upheld the patentability of claims whose only output was a number that was derived by processing the x-ray data. See *id.* at 908-910 (finding claim 6, directed to manipulating and displaying x-ray attenuation data, valid, and finding claims 33 and 36, whose output is numbers based on the x-ray attenuation data but not a display of an image, also valid ) (“while the display of claims 33 and 36 is only of a number, we have already disposed of the contention that the last step of a claim may not be a number.” *Id.* at 910.) The *Bilski* decision expressly cited and approved of the holding in *Abele*. See *Bilski*, slip opinion at 25-26, holding that because the data represented a tangible physical object, computerized transformation of the data was sufficient to satisfy the “transformation” test for patentable subject matter.

It is well understood, of course, that genetic sequences of the type transformed by the claims herein are representations of a physical structure, namely the molecular structure constituting all or part of the genome. The genetic sequence may be represented in a computer as a sequence of letters, but those letters each represent a specific chemical structure, and those structures are linked in a specific way; indeed, the genetic sequence could be displayed on a computer display as a visual image of some or all of the double stranded DNA helix that makes up the genome rather than as the sequence of letters that represents it. Thus, the manipulation in the claims herein represents the manipulation of images of physical objects, just as is the case of the x-ray data in *Abele*. Among the steps of the claims, for example, are comparisons of two different genetic sequences, perhaps representing portions of two different genomes; by transforming the data the two sequences represent, their degree of similarity or difference can be determined. This is akin to comparing two x-rays to determine the degree of similarity or difference between the objects the x-rays represent.

It follows that claims 4 and 47 as amended are allowable for this reason as well.

Since all other claims depend directly or indirectly from claims 4 and 47, they also satisfy the Section 101 patentable subject matter test.

#### Section 112 Rejections

The Examiner has rejected all pending claims under Section 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter Applicants regard as the invention.

#### Claims 4 and 47

The Examiner rejected claim 4 (and implicitly rejected claim 47, which contained the same language) on the ground that it included “outputting at least one of the first percent identity, the second percent identity, a third percent identity, ...” but there was no prior reference to a third identity. Applicants have amended claims 4 and 47 to read “outputting at least one of a percent identity, ... .”

Applicants respectfully request that based upon the above amendment, the Examiner should remove the rejections of claims 4 and 47 on § 112 grounds.

The Examiner rejected dependent claims 2-22, 26-33, 48-49, and 50-57 which depend from claims 4 or 47 on the same grounds. Based upon the amendments made, these dependent claims also now are allowable.

#### Claim 13

The Examiner rejected claim 13 on the ground that its language “at least one database including at least one sequence, and, retrieving at least one of the first sequence and the second sequence from the at least one database” was unclear. Applicants have amended the said claim to read “at least one database including ~~at least one sequence, a~~ plurality of sequences, and, retrieving ... at least one of the first sequence and the second sequence from the at least one database.” Applicants respectfully submit that this

amendment overcomes the Examiner's rejection, and claim 13 as amended now is allowable.

#### Telephone Conversation with Examiner

The undersigned thanks the Examiner for the courtesies extended during the telephone conversation on February 17, 2009. During that time, the participants discussed the pending rejections on Section 101 and Section 112 grounds and, pending client approval, possible amendments to claim language in claims 4 and 13 to overcome them. The participants also discussed the *Bilski* case and possible amendments relating to that decision. The amendments set forth herein reflect the results of the telephone conversation.

#### **CONCLUSION**

In view of the foregoing amendment and remarks, Applicants consider the Response herein to be fully responsive to the referenced Office Action, and respectfully submits that all of the pending claims are now in condition for allowance. Early and favorable reconsideration is therefore respectfully solicited.

If there are any remaining issues or the Examiner believes that a telephone conversation with Applicants' attorney would be helpful in expediting the prosecution of this application, the Examiner is invited to call the undersigned at 617-832-1118.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those which may otherwise be provided for in documents accompanying this paper; however, in the event that additional extensions of time are necessary, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a). Should an extension of time be required, Applicants request that the extension fee and any other fee required for timely consideration of this application be charged to Deposit Account No. 06-1448, Reference GIO-101.

The Commissioner is hereby authorized to charge any under-payments or credit any overpayments to our Deposit Account No. 06-1448

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